Environmental & Economic Benefits of Green Chemistry (from the perspective of "downstream users")

March 20, 2013

Mark Rossi, PhD

CLEAN PRODUCTION ACTION

A non profit organization that collaborates with businesses, governments and NGOs to design and deliver strategic solutions for:

Green chemicals

Sustainable materials

Environmentally preferable products

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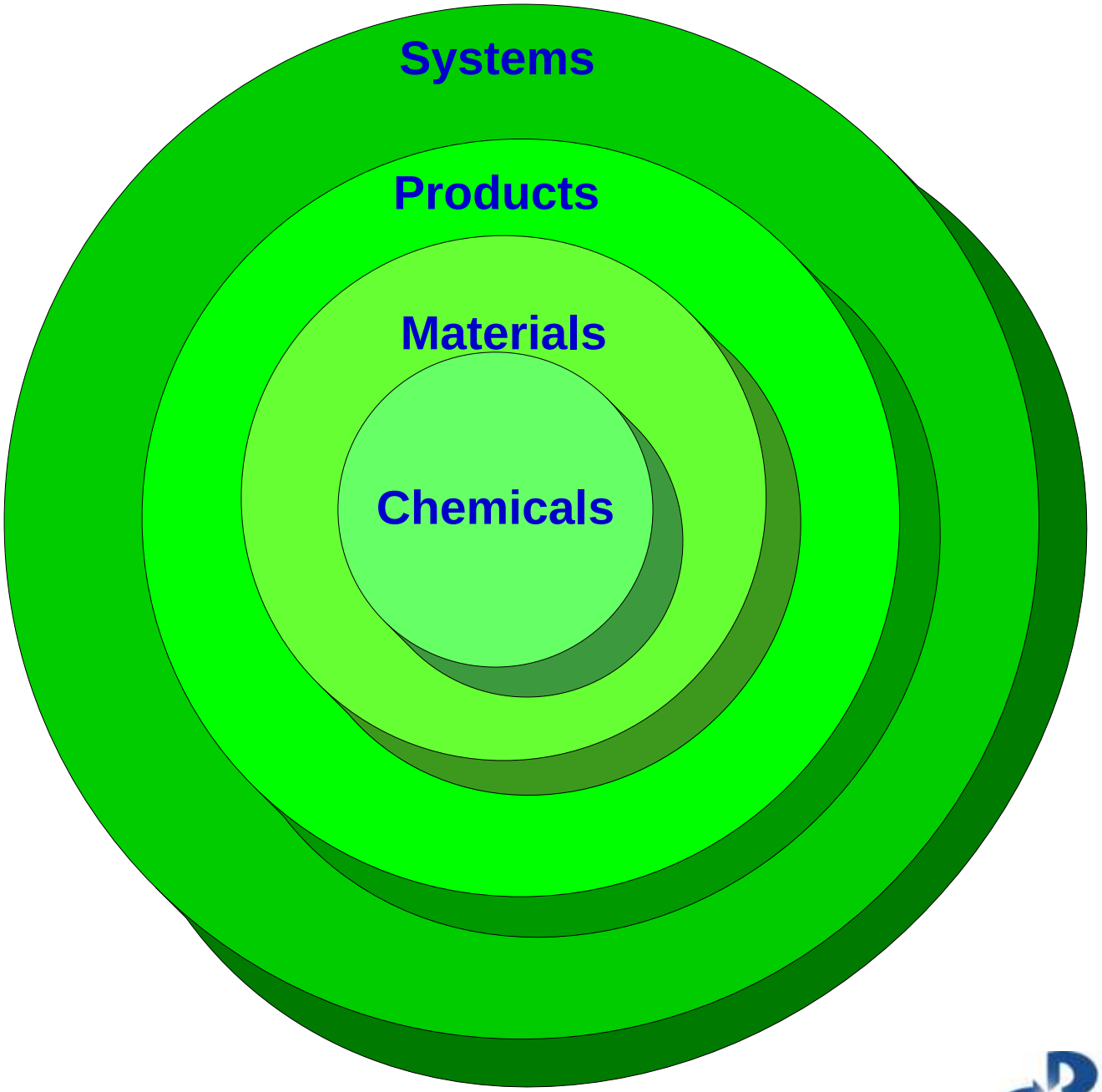
ACTION



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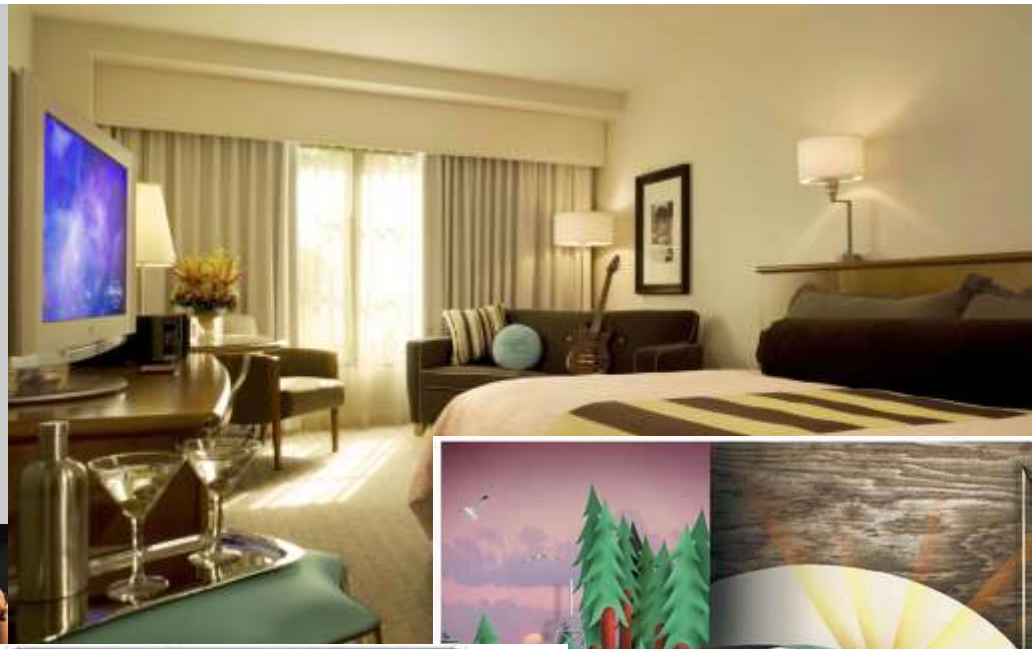
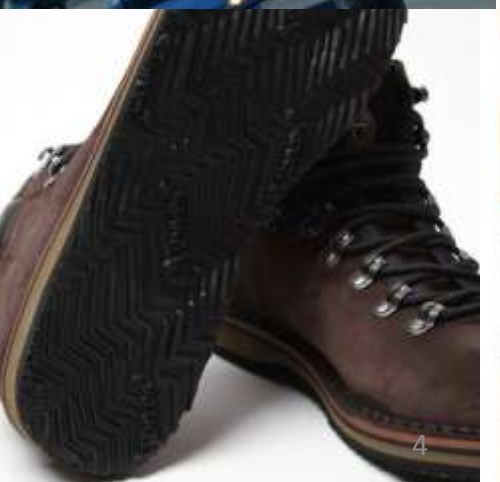
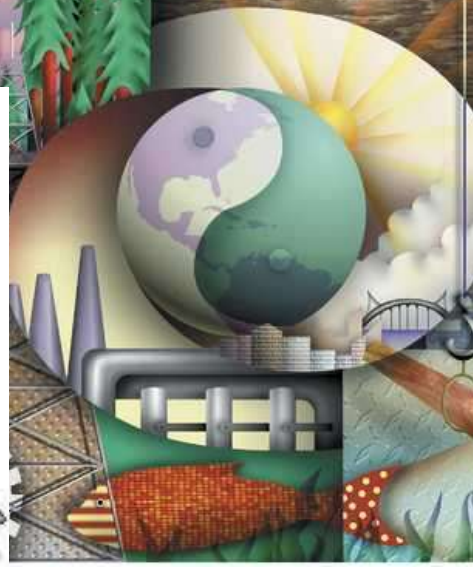
BizNGO

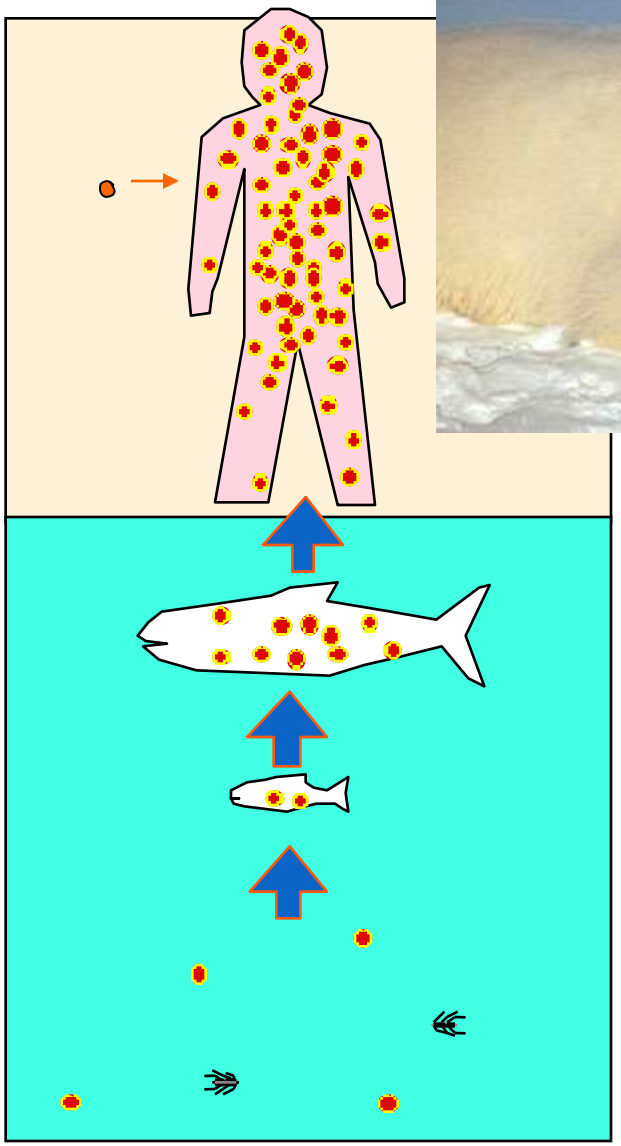
FOR SAFER CHEMICALS AND SUSTAINABLE MATERIALS







PBTs



- **Persistent**
- **Bioaccumulative**
- **Toxic**

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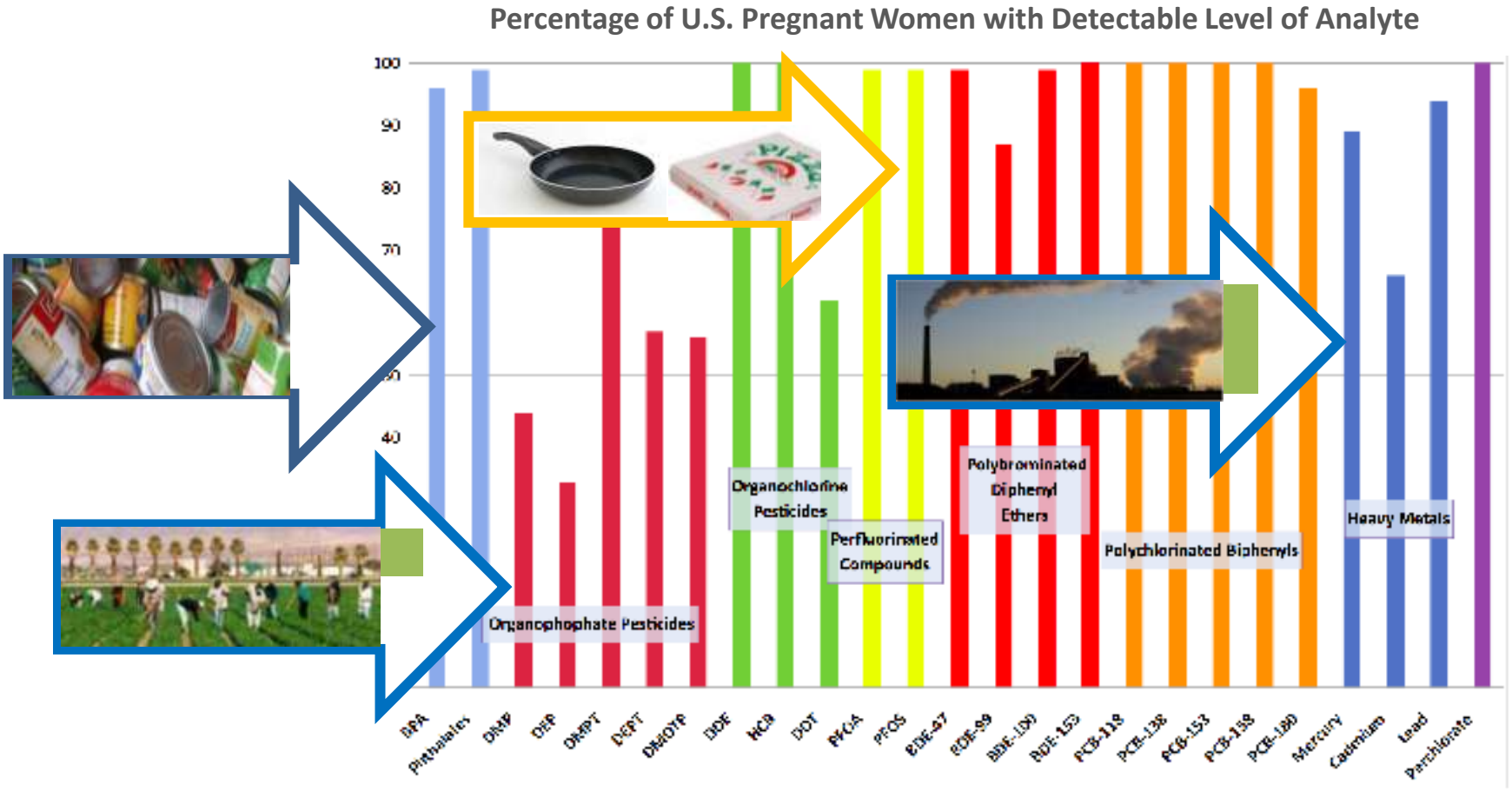
Widespread Exposure to Chemicals with Reproductive & Developmental Toxicity

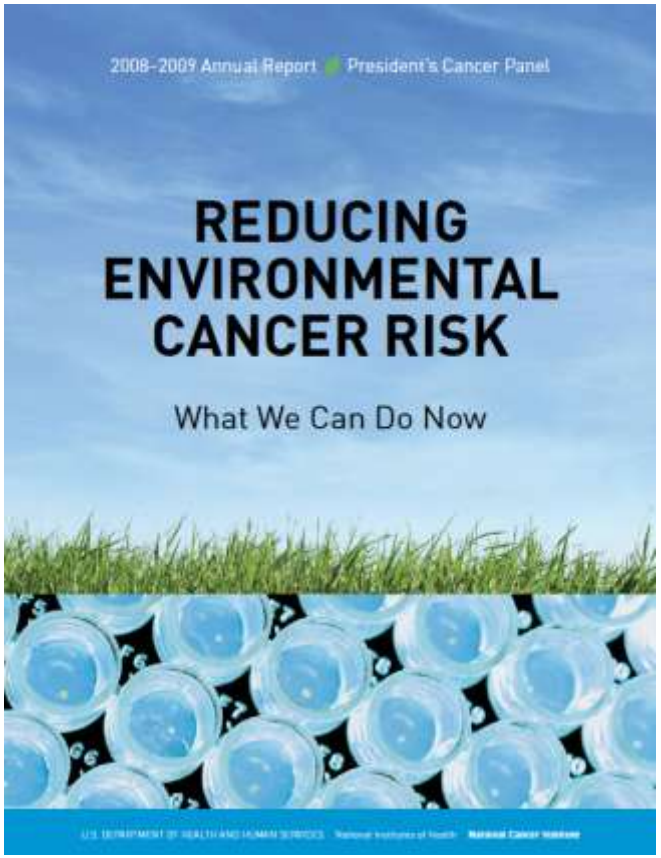


Based on analysis of representative sample of U.S. population by NHANES 2003-2004. Note, not all women were tested for all chemicals

Source: Woodruff TJ, Zota AR, Schwartz JM 2011. Environmental Chemicals in Pregnant Women in the US: NHANES 2003-2004. Environ Health Perspect :-. doi:10.1289/ehp.1002727

Chronic Disease Burden: Percent from Chemicals

- 3% of developmental disabilities**
- 5% of childhood cancer***
- 10% of diabetes, Parkinson's Disease and neuro-developmental disabilities****
- 10% of children's neurobehavioral disorders***
- 30% of childhood asthma*



* European Commission
** National Research Council
*** Mt. Sinai School of Medicine Center for Children's Health and the Environment
**** Environment Canada

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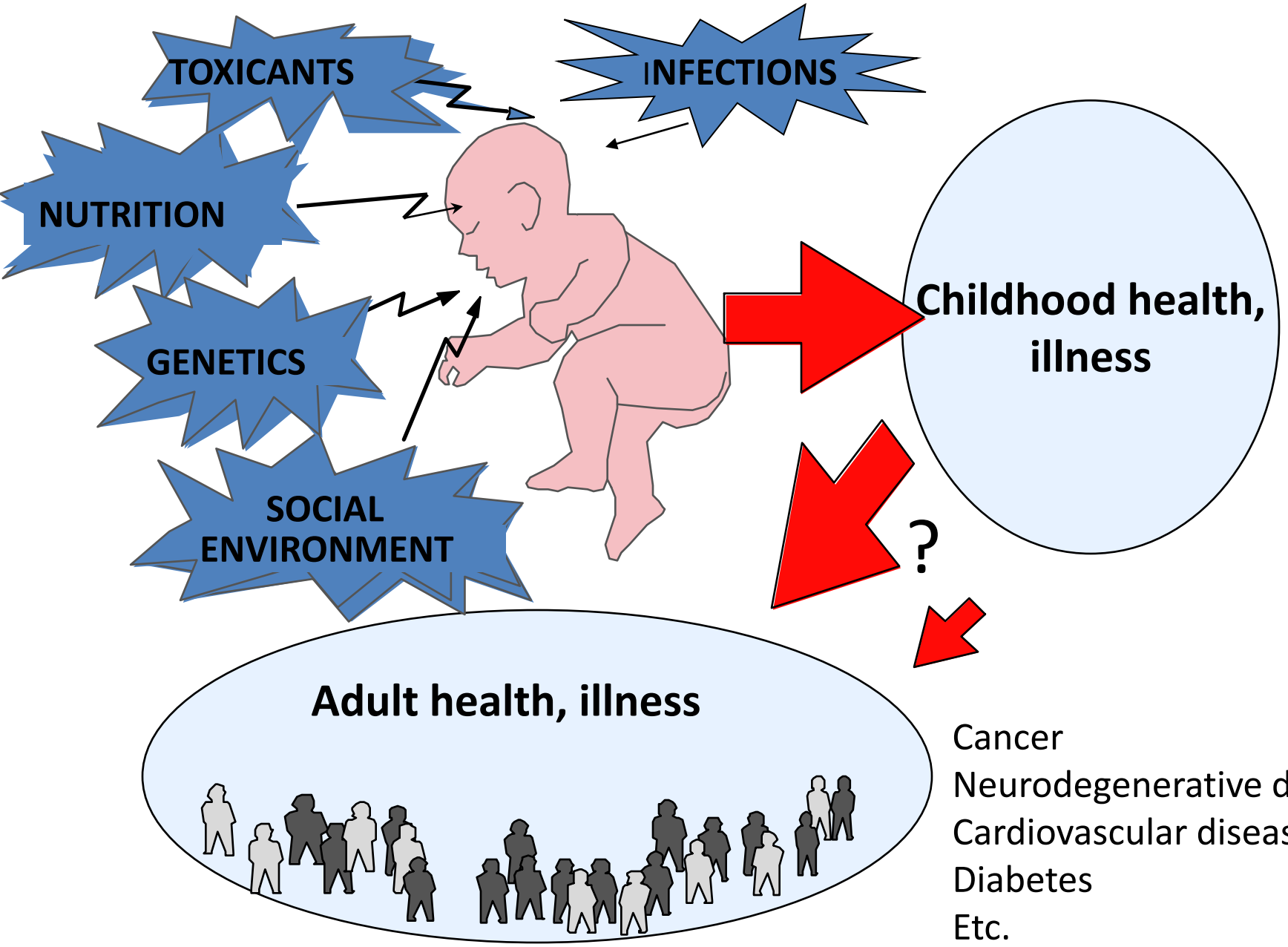
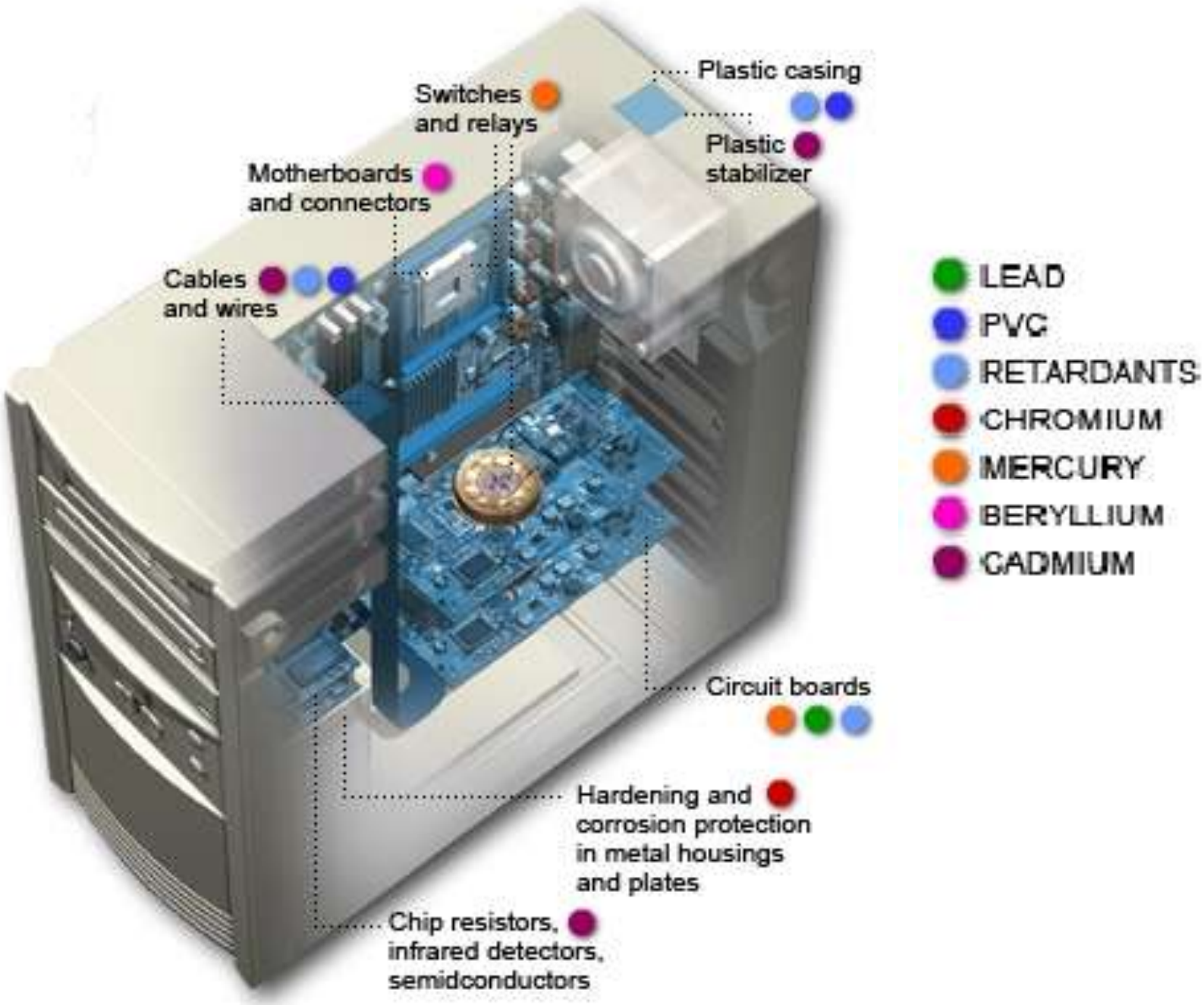
Unique windows of vulnerability



Cancer
Neurodegenerative disease
Cardiovascular disease
Diabetes
Etc.


Plastic casing
Switches and relays
Plastic stabilizer
Motherboards and connectors
Cables and wires
Circuit boards
Hardening and corrosion protection in metal housings and plates
Chip resistors, infrared detectors, semidconductors
LEAD
PVC
RETARDANTS
CHROMIUM
MERCURY
BERYLLIUM
CADMIUM

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Environmental Benefits of Implementing Green Chemistry

- Reduced exposure to chemicals of concern to human health & environment across life cycle
  - Feedstocks
  - Manufacturing
  - Use
  - End of life Management
- Reduced exposure across the globe
- Healthier Communities, Materials, Products, People & Planet

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PASSIVE TO ACTIVE

All unrestricted replacements are accepted

Focus on cost, performance, reliability

Not screening replacements for environment

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NEED

Growing consumer concern

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Growing consumer concern

Shifting regulatory environment

RoHS 2002 95 EC

REACH COMPLIANCE

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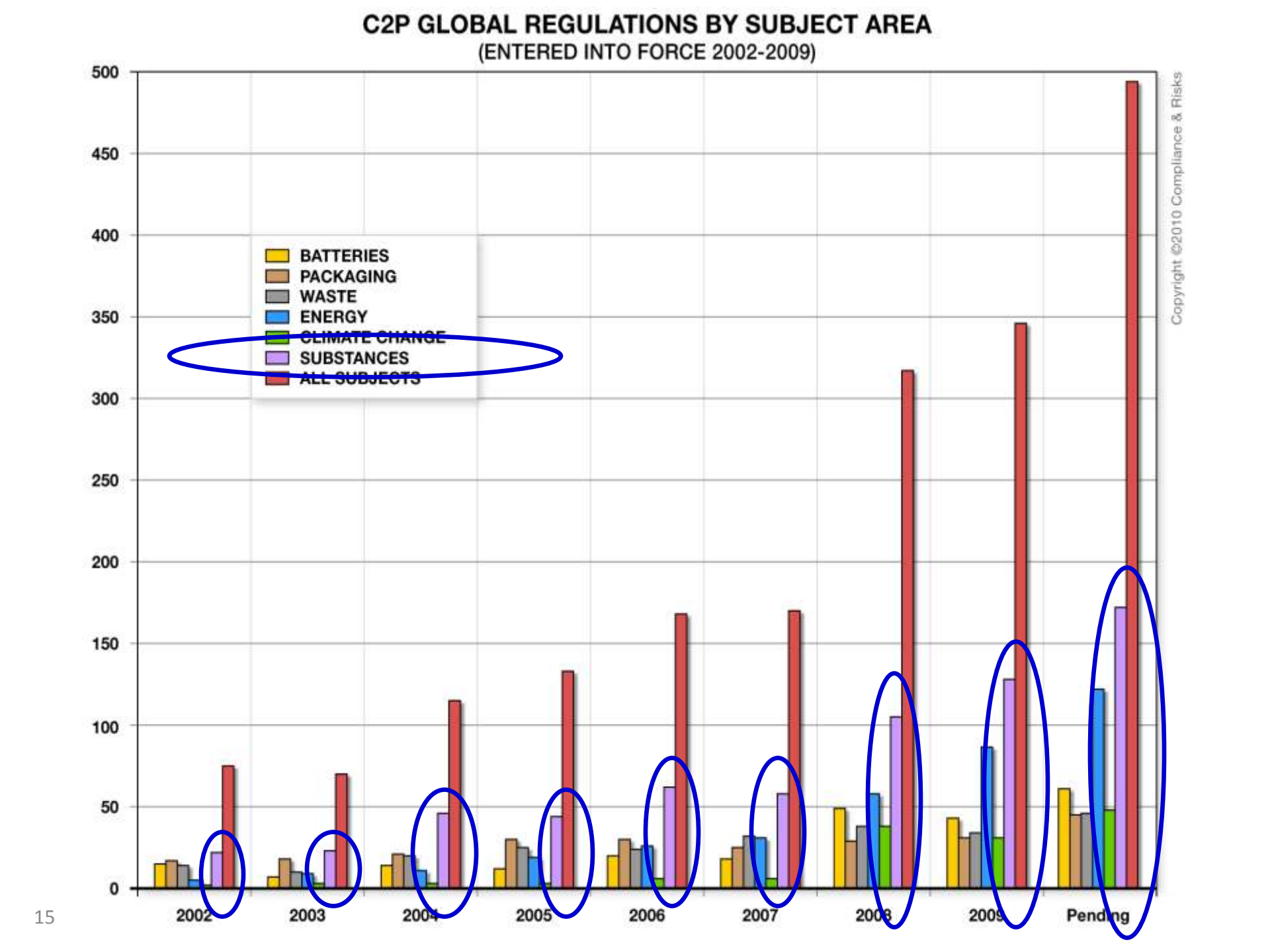
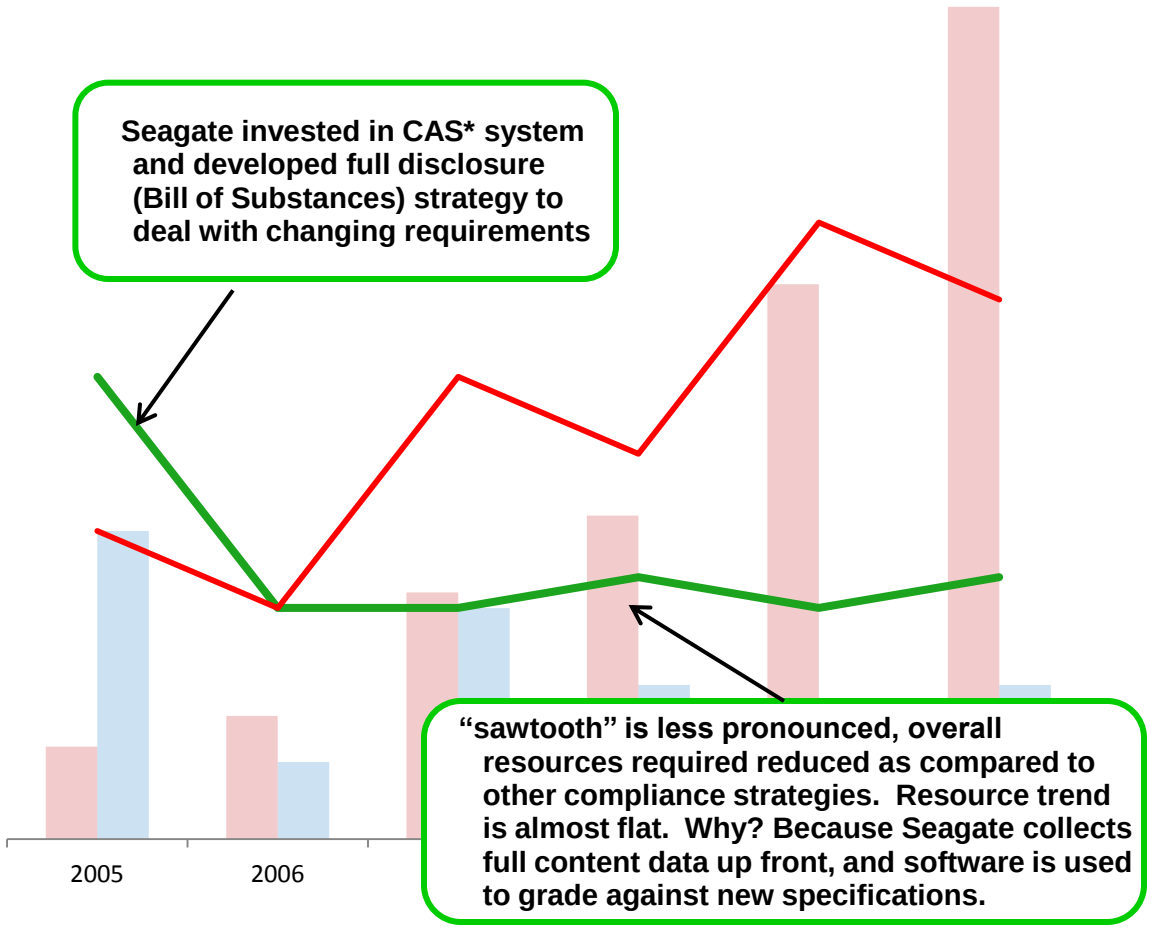

C2P GLOBAL REGULATIONS BY SUBJECT AREA
(ENTERED INTO FORCE 2002-2009)
500
450
400
350
300
250
200
150
100
50
0
BATTERIES
PACKAGING
WASTE
ENERGY
CLIMATE CHANGE
SUBSTANCES
ALL SUBJECTS
2002
2003
2004
2005
2006
2007
2008
2009
Pending
Copyright ©2010 Compliance & Risks

By investing early in full disclosure data, Seagate has been able to flatten the 'sawtooth' in resource requirements



Seagate is able to respond quickly to changing substance restrictions

Seagate effectively manages substance restrictions at low, predictable cost and resource levels

*CAS – Compliance Assurance System, Seagate's materials content compliance system

Slide courtesy of Brian Martin, Seagate

PASSIVE TO ACTIVE

Growing consumer concern

Shifting regulatory environment

Cost of multiple substitutions

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Stay ahead of regulatory & market uncertainty

Use safer alternatives / green chemistry

Create positive lists to avoid unintended consequences

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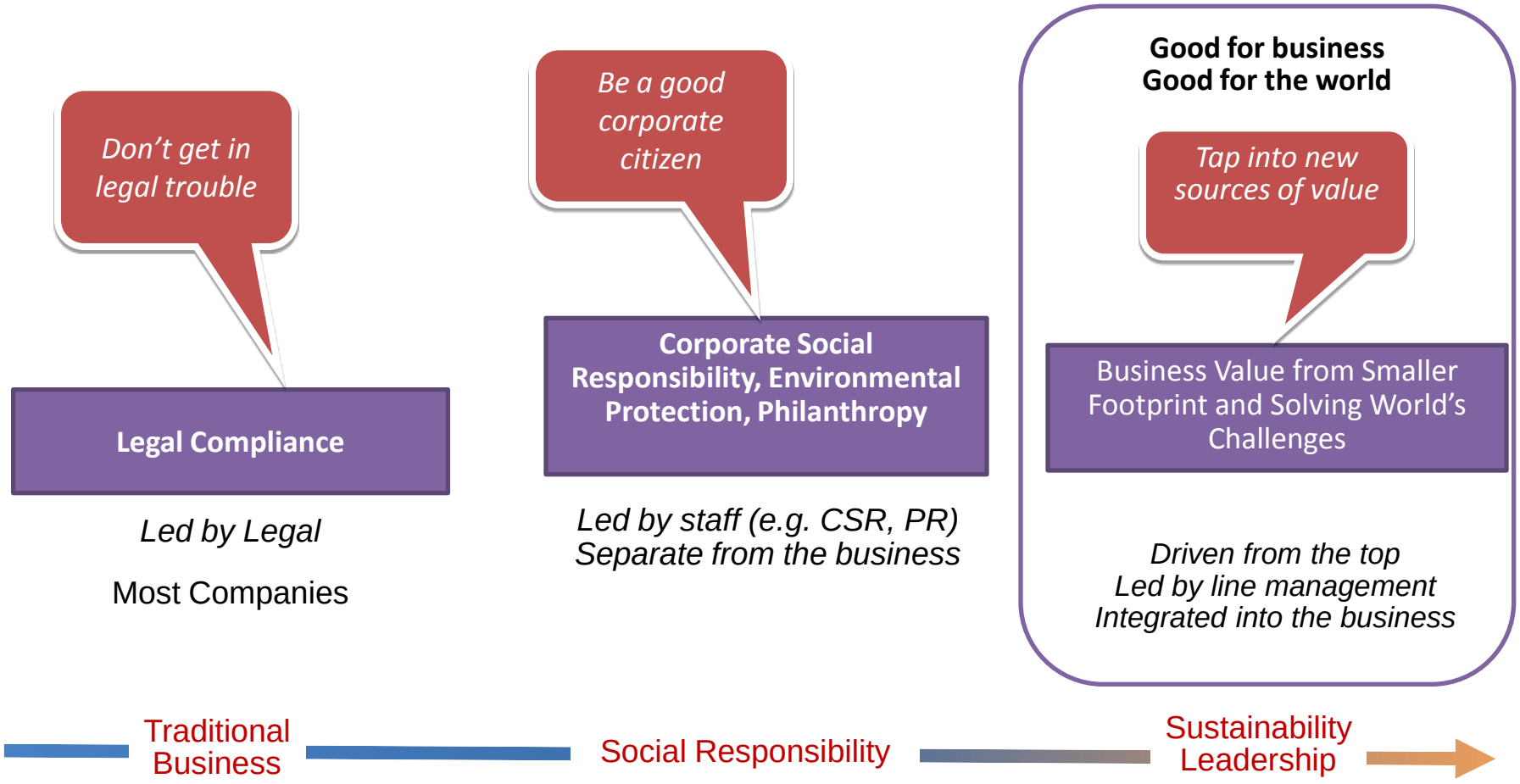
HP Uses GreenScreen™ to Choose Alternatives to Substances of Concern

- Select alternatives that <u>won't be restricted in the future</u>
  - E.g., Low toxicity
- Helps articulate materials goals to suppliers
  - Not simply saying what HP doesn't want
  - Defining what HP does want in its products

Green Screen Assessments of Similar Function Chemical

Common Name	CAS #	Full Name	Benchmark
Preferred			
Design	none	Design material out, dematerialize	4
Substance 0	#####-##-#	Chemical name	4
Use but still opportunity for improvement			
Substance 1	#####-##-#	Chemical name	3
Substance 2	#####-##-#	Chemical name	3
Use but search for alternatives			
Substance 3	#####-##-#	Chemical name	2
Substance 4	#####-##-#	Chemical name	2
Substance 5	#####-##-#	Chemical name	2
Substance 6	#####-##-#	Chemical name	2
DO NOT USE			
Substance 7	#####-##-#	Chemical name	1
Substance 8	#####-##-#	Chemical name	1
Substance 9	#####-##-#	Chemical name	1
Substance 10	#####-##-#	Chemical name	1
Substance 11	#####-##-#	Chemical name	1
Substance 12	#####-##-#	Chemical name	1

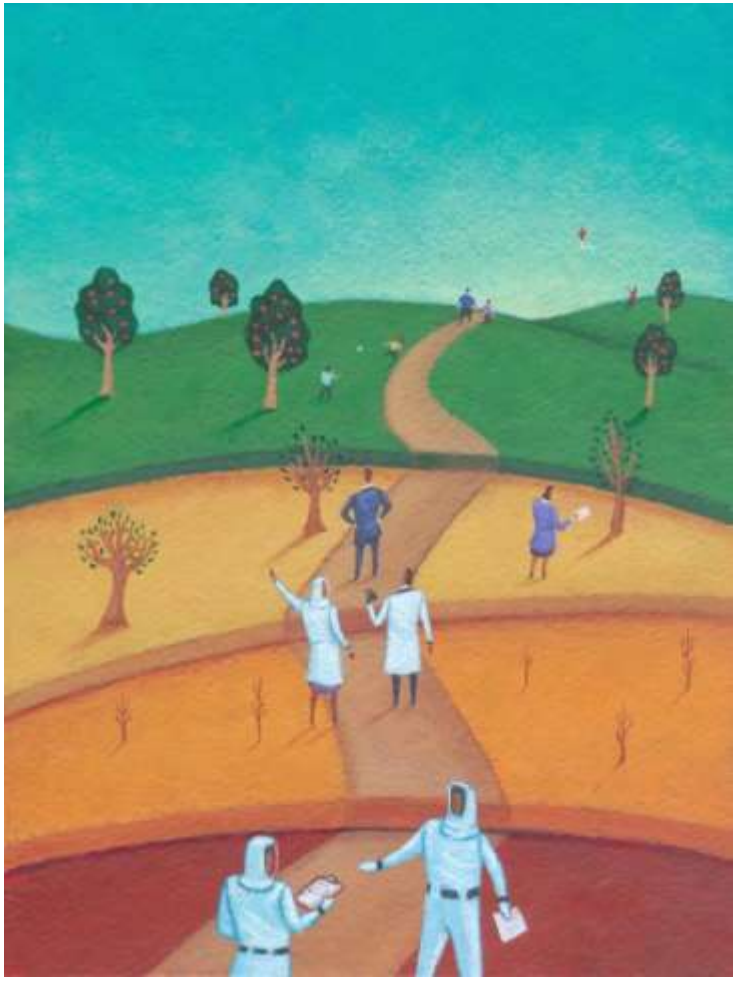
Our business customers approach chemicals management and pollution prevention in different ways



Courtesy of Roger McFadden, Staples

Economic Benefits of Green Chemistry for Downstream Users

- Ahead of market & regulatory demands
  - Laws and customer demand can change faster than product design cycle
- Risk management
  - Protect market share
  - Protect brand reputation
  - Know potential life cycle liabilities– upstream manufacturing to downstream use and disposal
- Lower costs
  - Avoid costly recalls
- Better supply chain management
- Increase market share and revenues



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Solutions for Downstream Users

RØADMAP
TO **ZERO D**ISCHARGE OF
HAZARDOUS **C**HEMICALS

OUTDOOR INDUSTRY ASSOCIATION
SUSTAINABILITY WORKING GROUP

Chemicals Management Framework

Plastics Scorecard

GREEN SCREEN FOR SAFER CHEMICALS

SBC
SUSTAINABLE BIOMATERIALS COLLABORATIVE

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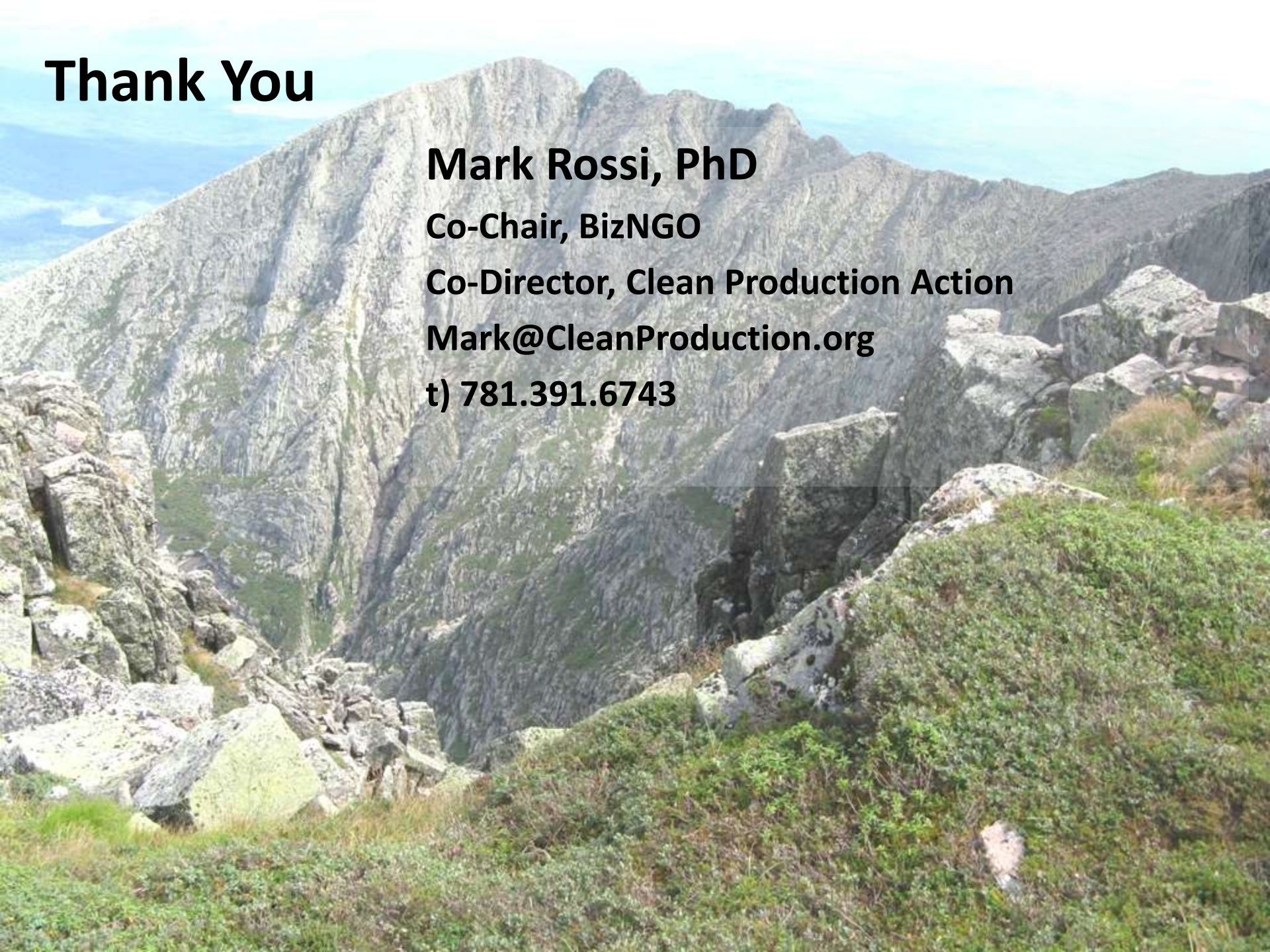
Thank You



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